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ABSTRACT

In standard American Spanish, the velar nasal surface variant of systematic /n/ occurs only in syllable-final environments, when the immediately following segment is a velar consonant. In many American Spanish dialects, however, "ng" may also optionally appear phonetically in other phonological environments. Cuban Spanish is such a dialect, in which "ng" may appear as a surface manifestation of /n/ in any phonological environment, with greatly varying degrees of percentages of occurrence. In this study, the surface manifestations of systematic /n/ were tabulated from five hours of tape-recorded free conversations of twenty-one native speakers of Cuban Spanish, in the following environments: (1) absolute-final; (2) word-final within a breath-group; (3) syllable-final within a word; (4) syllable-initial. Based on the frequencies of occurrence of these surface variants of /n/ in the four previously mentioned phonological environments, variable phonological rules are proposed for Cuban Spanish rapid speech. The occurrence of standard nasal assimilation versus the occurrence of the velar nasal across word-boundaries within a breath-group and across syllable-boundaries in Cuban Spanish is also discussed, and a revision of the rule of nasal assimilation found in Harris 1969 is proposed, since Harris' rule does not account for nasal assimilation before glides or nasals, as may occur in Cuban Spanish as well as in other American Spanish dialects.
(Author/CFM)

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The Velar Nasal in Rapid Cuban Spanish

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In Standard American Spanish the velar nasal appears phonetically, as a surface variant of systematic /n/, only in syllable-final position, when immediately followed by a velar consonant. In many American Spanish dialects, however, [ŋ] appears in several other environments. Cuban Spanish is one such dialect, in which [ŋ] may occur in any phonological environment with, of course, varying degrees of percentage of occurrence.

In this study, the different surface variants of the systematic nasal /n/ were recorded and tabulated in the following environments: (1) absolute-final position; (2) word-final position within a breath-group; (3) syllable-final position within a word; (4) syllable-initial position.

The data used in this study were taken from five hours of recorded tapes made from totally unstructured free conversations involving twenty-one informants, all of whom are native speakers of Cuban Spanish, and who are now permanent residents of the Miami, Florida area. There were thirteen female and eight male informants, whose ages ranged from twenty-two to fifty-five years, their median age being twenty-six years. Of these twenty-one informants, all but two have received an education through the university level; the

remaining two partially completed high school. The informants used represent all Cuban provinces except Pinar del Río, with the majority (52.4%) being from the province of La Habana.

Table I presents the different surface manifestations of systematic /n/ in absolute-final position. As shown herein, the most frequent surface variant of systematic /n/ in absolute-final environments is the velar nasal [ŋ], occurring 83.0% of the time. The other four phonetic variants for systematic /n/ when it occurs in absolute-final position, [n, ã, ẽ, ẽʔ] ,[1] occur in rather insignificant frequencies, 7.3%, 4.9%, 2.4%, and 2.4%, respectively.

(TABLE I)

Surface Variant	Number of Occurrences	Percentage of Occurrences
[ŋ]	136	83.0
[n]	12	7.3
[ã]	8	4.9
[ẽ]	4	2.4
[ẽʔ]	4	2.4

TABLE I

PHONETIC VARIANTS OF SYSTEMATIC /n/

IN ABSOLUTE-FINAL POSITION

The data presented in Table I show that there must be a rule of nasal velarization of systematic /n/ in absolute-final position for Cuban Spanish rapid speech, as shown below in (1):

(1) NASAL VELARIZATION

$$/n/ \longrightarrow [ŋ] \; / \; ____\#\#$$

Based on the data presented in Table I, this rule, although optional, will occur 83.0% of the time in Cuban Spanish rapid speech.

In order to account for the nasalized vowels [ã], [ẽ], and [ẽ'], which according to the data in Table I occur at a total frequency rate of 9.7%, Cuban Spanish rapid speech must contain the following two rules, shown below as (2) and (3):

(2) VOWEL NASALIZATION

$$/V/ \longrightarrow [\tilde{V}] \; / \; ____N\#\#$$

(3) NASAL CONSONANT DELETION

$$/N/ \longrightarrow [ø] \; / \; N____\#\#$$

Rule (2) is obligatory, at least to the degree that in Spanish, as in many other languages of the world, a vowel followed by a nasal consonant will obligatorily contain some degree of nasalization.

Rule (3) is optional, and as shown in Table I, has occurred 9.7% of the time in this speech sample of

Cuban Spanish in absolute-final position.

Table II shows the different phonetic forms of systematic /n/ in word-final environments followed by a consonant, as to whether normal, i.e. standard, nasal assimilation has occurred across the word-boundary, or if the velar nasal [ŋ] has occurred.

(TABLE II)

Initial Segment of Following Word	Normal Nasal Assimilation		Velar Nasal	
	No.	%	No.	%
Bilabial	3	.3	81	8.1
Labiodental	1	.1	15	1.5
Dental	2	.2	90	9.0
Alveolar	12	1.2	128	12.9
Palatoalveolar	2	.2	14	1.4
Palatal	0	0	0	0
Glottal	0	0	0	0
Totals	20	2.0	332	33.5

TABLE II

PHONETIC VARIANTS OF SYSTEMATIC /n/

IN WORD-FINAL POSITION (992 OCCURRENCES)

From the transcribed tapes used in this study, there was a total of 992 occurrences of systematic /n/ in word-final position followed by a consonant. Of this total of 992 occurrences, 656 resulted in: (1) the velar nasal [ŋ] (662 occurrences or 62.9%); (2) standard nasal assimilation (20 occurrences or 3.4%). The remaining 336 occurrences of /n/ in this environment, which will be accounted for in Table IV, were phonetically deleted, with prior nasalization of the preceding vowel.

Table II clearly shows that, at least in Cuban Spanish rapid speech, nasal assimilation across word-boundaries is the exception and not the rule. Standard nasal assimilation occurred in only 2.0% of the total surface manifestations of systematic /n/ in this environment; in the remaining 98.0% of the total occurrences, either the velar nasal occurred, or nasal deletion took place.

Table III presents the data given previously in Table II, but this time in terms of the percentages of occurrence of the velar nasal versus standard nasal assimilation, relative to the different points of articulation of the initial segment of the following word.

(TABLE III)

Initial Segment of Following Word	Total Number of Occurrences	Normal Nasal Assimilation		Velar Nasal	
		No.	%	No.	%
Bilabial	84	3	3.5	81	96.5
Labiodental	16	1	6.2	15	93.8
Dental	92	2	2.2	90	97.8
Alveolar	140	12	8.6	128	91.4
Palatoalveolar	16	2	12.5	14	87.5
Palatal	0	0	0	0	0
Glottal	4	0	0	4	100.0

TABLE III

VELAR NASAL VERSUS NASAL ASSIMILATION

IN WORD-FINAL POSITION

Table III shows that, across word-boundaries, the velar nasal predominates in Cuban Spanish rapid speech, occurring from 87.5% to 100.0% of the time. These data clearly support the information provided in many other studies of Cuban Spanish phonology which show the velar nasal to occur frequently in word-final environments. The data in Table III reflect the fact that at word-boundaries, the velar nasal occurs an average of 94.5% of the time, while standard nasal assimilation across word-boundaries occurs only 5.5% of the time.[3]

The data presented in Tables II and III account for only 55.8% of the total occurrences of systematic /n/ in word-final environments within a breath-group. The remaining 33.7% of the occurrences of underlying /n/ in this environment (i.e., / ____#C) are accounted for in Table IV.

The first half of Table IV accounts for the five vowels of Spanish, followed by a nasal consonant, when the vowel has been nasalized and then the nasal consonant has been deleted, as previously discussed in rules (2) and (3) of this study. The second half of Table IV presents these same surface variants of /n/, i.e. [$\tilde{V}$], but when they are followed by a glottal

glottal stop, i.e. [ṽʔ].

Table IV shows that the process of vowel nasalization and nasal consonant deletion, with or without a following glottal stop, is quite frequent in Cuban Spanish rapid speech. While [ŋ] in this word-final environment predominates (62.9%), the [ṽ] process (27.7%) and the [vʔ] process (6.0%) together totalling 33.7%, is much more significant than the nasal assimilation of Standard Spanish, which in these data occurred only 3.4% of the time. As the processes resulting in surface manifestations of /VN/ as [ṽ] or [ṽʔ] occur in all phonological environments in Cuban Spanish rapid speech, these processes will be discussed more fully in the final portion of this study, along with the theoretical implications they involve.

The data presented in Tables II, III, and IV suggest the need for several variable rapid speech rules in the phonological component of Cuban Spanish.

(TABLE IV)

Surface Form	Number of Occurrences	Percentage of Occurrences (from total occurrences of /n/ in word-final environments)
/an/ ⟶ [ã]	40	4.0
/en/ ⟶ [ẽ]	116	11.7
/in/ ⟶ [ĩ]	0	0
/on/ ⟶ [õ]	80	8.0
/un/ ⟶ [ũ]	40	4.0
/an/ ⟶ [ã?]	8	0.8
/en/ ⟶ [ẽ?]	12	1.2
/in/ ⟶ [ĩ?]	0	0
/on/ ⟶ [õ?]	28	2.8
/un/ ⟶ [ũ?]	12	1.2
Totals	336	33.7

TABLE IV

DELETION OF SYSTEMATIC /n/

IN WORD-FINAL ENVIRONMENTS

Tables II and III show the need for a rule of word-final nasal velarization, shown below as (4):

(4) WORD-FINAL NASAL VELARIZATION (optional)

/N/ ⟶ [ŋ] / _____#

The above rule, although optional, would occur 62.4% of the time, based on the data used in this study.

The other rule suggested by Tables II and III is that of nasal assimilation, as it occurs in other dialects. This rule is shown below as (4):[4]

(5) NASAL ASSIMILATION (optional)

$$[+\text{nasal}] \longrightarrow \begin{bmatrix} \alpha\,\text{cor} \\ \beta\,\text{ant} \\ \gamma\,\text{back} \\ \delta\,\text{dist} \\ \varepsilon\,\text{high} \end{bmatrix} \; / \; _____(\#) \; \begin{bmatrix} -\text{syl} \\ \alpha\,\text{cor} \\ \beta\,\text{ant} \\ \gamma\,\text{back} \\ \delta\,\text{dist} \\ \varepsilon\,\text{high} \end{bmatrix}$$

The above rule of nasal assimilation would be optional, and occur at a rate of 3.4%.

In regard to the above proposed rule of nasal assimilation for Cuban Spanish, it should be noted that this rule will not account for the occurrence of the velar nasal before a glottal segment in this dialect, e.g. un jorobado, 'a hunchback' [uŋhoroβáðo], nor will

it account for the nasal, presumably velar, that occurs before a following uvular segment found in other Spanish dialects, e.g. un jorobado [unxoroβάðo].

Given the present framework of generative phonology, there is no way to formalize nasal assimilation to a following uvular or glottal segment, with the systematic nasal surfacing as [ŋ]. Nor could we, or perhaps better said, would we want to formalize the rule of nasal assimilation so as to have either a uvular nasal before [X] or a glottal nasal before [h] as a surface output, since uvular nasals and glottal nasals are physiologically impossible.

It is suggested here that rule (5) above captures the facts of nasal assimilation in these dialects, because it captures the fact that the velar nasal, being the most back nasal that is physiologically possible, occurs in these environments.

If, however, a dialect exists where any nasal other than [n] or [ŋ] occurs before [X] or [h], then rule (5), or any other heretofore proposed rule, could not account for such processes.

Table IV shows the need for rules of vowel nasalization and nasal consonant deletion, previously shown as (2) and (3) in this study, with a generalization of

the environments, as shown below in (6) and (7):

(6) VOWEL NASALIZATION (obligatory)

$/N/ \longrightarrow [\tilde{V}] \; / \; ____ N\#$

(7) NASAL CONSONANT DELETION (optional)

$/N/ \longrightarrow [\emptyset] \; / \; \tilde{V} ____ \#$

Rule (7) is optional, and would occur 33.7% of the time.

The percentages of occurrence of the velar nasal versus standard nasal assimilation of the total number of occurrences of systematic /n/ in syllable-final position within a word are shown in Table V.

(TABLE V)

Following Segment	Standard Nasal Assimilation		Velar Nasal	
	No.	%	No.	%
Bilabial	3	.3	49	4.8
Labiodental	4	.4	16	1.6
Dental	284	27.6	276	26.8
Alveolar	24	2.3	76	7.4
Palatoalveolar	4	.4	12	1.2
Palatal	0	0	0	0
Glottal	0	0	0	0
Totals	319	31.0	429	41.8

TABLE V

PHONETIC VARIANTS OF SYSTEMATIC /n/ IN SYLLABLE-FINAL POSITION (1028 OCCURRENCES)

From the total number of 1028 occurrences of /n/ in syllable-final position within a word,[5] a total of 752 of those occurrences resulted in: (1) the velar nasal [ŋ]--433 occurrences; (2) standard nasal assimilation--319 occurrences. The remaining 276 occurrences of /n/ in this environment will be accounted for in Table VI, since in all of these cases, the nasal consonant was deleted.

Table V shows that in Cuban Spanish rapid speech, across syllable-boundaries within a word, nasal assimilation does not predominate as in Standard Spanish, but rather, the velar nasal is most frequent in this environment, occurring 41.8% of the time, while standard nasal assimilation occurs at a frequency rate of only 31.0%. The remaining 26.8% are cases of n-deletion (see Table VIII). Although in this environment in Cuban Spanish rapid speech the velar nasal is most frequent, its higher percentage of occurrence is not nearly as strong as was the case before a pause or before a word-boundary within a breath-group.

Table VI presents a comparison of the occurrences of the velar nasal versus standard nasal assimilation, relative to the point of articulation of the initial segment of the following syllable, using the data

previously shown in Table V.

Table VI shows that in syllable-final position, within a word, the velar nasal again predominates over nasal assimilation as found in the standard language, but this time one exception must be noted. With the exception of a following dental segment across a syllable-boundary, within a word, the velar nasal occurs from 75.0% to 100.0% of the time. The data in Table VI reflect the fact that across syllable-boundaries within a word, the velar nasal occurs at a frequency rate of 57.6%, while standard nasal assimilation occurs at a rate of 42.4% in this same environment. While the velar nasal is still most frequent in this environment, its domination is not as strong as in absolute-final or word-final positions.[6]

The one exception, as noted in Table VI, where the velar nasal does not occur more frequently than nasal assimilation, is when the initial segment after the syllable-boundary is dental. Since there are only two non-nasal dental segments in Cuban Spanish, i.e. [t] and [d], differing only by the single feature [voice], the effect of the feature [voice] was studied in regard to its effect on a preceding nasal segment, in this environment. Table VII presents these data

(TABLES VI AND VII)

Initial Segment of Following Syllable	Total Number of Occurrences	Standard Nasal Assimilation		Velar Nasal	
		No.	%	No.	%
Vowel	4	0	0	4	100.0
Bilabial	52	3	5.8	49	94.2
Labiodental	20	4	20.0	16	80.0
Dental	560	284	50.7	276	49.3
Alveolar	100	24	24.0	76	76.0
Palatoalveolar	16	4	25.0	12	75.0
Palatal	0	0	0	0	0
Glottal	0	0	0	0	0

TABLE VI

VELAR NASAL VERSUS NASAL ASSIMILATION

IN SYLLABLE-FINAL POSITION

Initial Dental Segment After Syllable-boundary	Number of Occurrences	Velar Nasal		Dental Nasal	
		No.	%	No.	%
[-voice]	288	273	98.9	19	6.6
[+voice]	272	3	1.1	265	97.4

TABLE VII

VELAR NASAL VERSUS DENTAL NASAL

BEFORE DENTAL SEGMENTS

Table VII clearly suggests that the feature [voice] has a very strong effect on whether a velar nasal or normal nasal assimilation occurs before dental segments. Before the voiced segment [d], the velar nasal occurred only 1.1% of the time. Before voiceless [t], however, the velar nasal occurred 98.9% of the time.[7]

The data presented in Tables V and VI account for only 73.1% of the total occurrences of systematic /n/ in syllable-final environments within a word. The remaining 26.8% of the occurrences of underlying /n/ in this environment is accounted for in Table VIII.

(TABLE VIII)

Surface Form	Number of Occurrences	Percentage of Occurrences from Total Occurrences of /n/ in Syllable-final Position
/an/ ⟶ [ã]	72	7.0
/en/ ⟶ [ẽ]	84	8.1
/in/ ⟶ [ĩ]	4	.4
/on/ ⟶ [õ]	92	8.9
/un/ ⟶ [ũ]	16	1.6
/an/ ⟶ [ã?]	4	.4
/en/ ⟶ [ẽ?]	4	.4
/in/ ⟶ [ĩ?]	0	0
/on/ ⟶ [õ?]	0	0
/un/ ⟶ [ũ?]	0	0

TABLE VIII

DELETION OF SYSTEMATIC /n/ IN SYLLABLE-FINAL ENVIRONMENTS

The first half of Table VIII accounts for the five vowels of Spanish followed by a nasal consonant, when this vowel has been nasalized,with a later deletion of this syllable-final nasal consonant (see rules (2) and (3) of this study). The remaining half of Table VIII presents these same surface variants of /n/, i.e. [$\tilde{V}$], but now when they are followed by a glottal stop, i.e. [$\tilde{V}$ʔ].

Table VIII shows that vowel nasalization in syllable-final environments, followed by deletion of the nasal consonant, occurs at a percentage rate of 26.8. As was the case in word-final position within a breath-group, the velar nasal predominates, occurring at a percentage rate of 42.2, but in syllable-final environments, however, nasal assimilation is the second most frequent process, 31.0%, somewhat different to what was shown in word-final environments, in which /VN/ $\longrightarrow$ [$\tilde{V}$] occurred more frequently than nasal assimilation. In syllable-final environments, vowel nasalization followed by nasal consonant deletion occurred at a percentage rate of only 26.8.

The data presented in Tables V, VI, and VIII once again suggest the need for several variable rapid speech rules in the phonology of Cuban Spanish.

Tables V and VI suggest the need for a rule of syllable-final nasal velarization, shown below as (8):

(8) SYLLABLE-FINAL NASAL VELARIZATION (optional)

/N/ ⟶ [ŋ] / _____$

The above rule, being optional, occurs 42.2% of the time, based on the data under analysis in the present study.

Rules (1), (4), and (8) could, of course, be collapsed as shown in (9):

(9) NASAL VELARIZATION

$$/N/ \longrightarrow [ŋ] \;/\; ____ \begin{cases} \#\# & (83.0\%) \\ \# & (62.4\%) \\ \$ & (42.4\%) \end{cases}$$

The percentages shown in rule (9) indicate that the percentages of application of this rule are directly proportional to the strength of the boundary involved.

The other rule suggested by Tables V and VI is that of nasal assimilation, as previously shown in (5). This rule, also optional, would apply across word-boundaries, within a word, 31.0% of the time.

Table VIII shows the need for rules of vowel nasalization and nasal consonant deletion, as previously shown in (6) and (7), with an even more

general environment, as shown below in (10) and (11):

(10) VOWEL NASALIZATION (obligatory)

$$/VN/ \longrightarrow [\tilde{V}] \; / \; \underline{\quad\quad}\$$

(11) NASAL CONSONANT DELETION (optional)

$$/N/ \longrightarrow [\emptyset] \; / \; \tilde{V}\underline{\quad\quad}\$$

Rule (11) is optional, and occurs 26.8% of the time.

Rules (3), (7), and (11) can be collapsed, as shown below in (12):

(12) NASAL CONSONANT DELETION

$$/N/ \longrightarrow [\emptyset] \; / \; \tilde{V}\underline{\quad\quad} \begin{Bmatrix} \#\# \\ \# \\ \$ \end{Bmatrix} \begin{matrix} (9.7\%) \\ (33.7\%) \\ (26.8\%) \end{matrix}$$

From the percentages shown in rule (12), it can be seen that the rule of Nasal Consonant Deletion applies most frequently in word-final environments (33.7%), and least frequently in absolute-final position (9.7%). In syllable-final environments, rule (12) applies at a rate of 26.8%.

Systematic /n/ in syllable-initial position in the taped material under analysis in the present study appeared sporadically as [ŋ], as shown in the lexical items in (13):

(13)	Lexical item	Phonetic form
a.	cuneta 'trench'	[kuŋéta]
b.	maricones 'queers'	[marikóŋeh]
c.	enamorar 'to inspire love'	[eŋamorár]
d.	enamorada 'in love'	[eŋamoráđa]
e.	enamoras 'you inspire love'	[eŋamórah]
f.	Leninistas 'Leninists'	[leniŋíhtah]
g.	vinieron 'they came'	[biŋyéron]

Also, in two isolated cases, systematic syllable-initial /n/, as shown below in (14), was phonetically realized just as nasalization on the preceding vowel:

(14)	Lexical item	Phonetic form
a.	enamorar 'to inspire love'	[ẽamorár]
b.	enamora 'he inspires love'	[ẽamóra]

In all but the ten cases shown in (13) and (14) (Leninistas appeared twice), systematic /n/ in syllable-initial position appeared as [n].

In all of the lexical items in (13) and (14), except for cuneta, either a prefix-boundary or a morpheme-boundary is involved, i.e. items (13c), (13d), (13e), (14a) and (14b) all contain the prefix en-; item (13b) contains a morpheme-boundary between the singular surface form maricón and the -es plural

marking suffix; item (13g) contains a morpheme-boundary between the irregular preterite stem vin- and the third-person plural marker. It is possible in all these cases (excluding cuneta) that the nasal velarization process might be effected by the presence of these boundaries.

Since the process of vowel nasalization and following nasal consonant deletion appears to be a rather frequent process in Cuban Spanish, occurring 33.7% of the time in word-final environments, and 26.8% of the time in syllable-final position, the question arises as to whether the segment following the syllable-boundary or word-boundary has any effect on these two previously mentioned processes.

Tables IX through XIII analyze the five Spanish vowels, relative to the following segment, in all cases where the process of vowel nasalization and a following deletion of the nasal consonant has taken place.

Table IX shows that the process /an/ $\Longrightarrow$ [$\tilde{a}$(ʔ)] occurs:[8] (1) most frequently in syllable-final position, 54.3% (51.4% and 2.9%); (2) word-finally before vowels at a rate of 28.4% versus 65.9% before a following consonant.

(TABLE IX)

Following Segment	[ã] / ___# No.	%	[ã] / ___$ No.	%	[ã?] / ___# No.	%	[ã?] / ___$ No.	%
##								
[a]	16	11.3						
[i]	12	8.5						
[u]	4	2.9						
[t]	8	5.7	8	5.7			4	2.9
[d]			60	42.8				
[s]			4	2.9				
[l]	4	2.9			8	5.8		
[k]	4	2.9						
Totals	48	34.2	72	51.4	8	5.8	4	2.9

TABLE IX

SEGMENTS FOLLOWING /an/ WHEN

IT APPEARS AS [ã] OR [ã?]

Table X shows that the process /en/ $\Longrightarrow$ [ẽ(ʔ)] occurs: (1) most frequently in word-final position within a breath-group, 49.2% (45.8% and 3.4%), although this same process occurs almost as frequently, 42.4% (40.7% and 1.7%), in syllable-final environments within a word; (2) before vowels at a percentage rate of 17.0 versus 74.5% before a following consonant.

(TABLE X)

Following Segment	[ẽ] /__## No.	%	[ẽ] /__# No.	%	[ẽ] /__$ No.	%	[ẽʔ] /__## No.	%	[ẽʔ] /__# No.	%	[ẽʔ] /__$ No.	%
##	4	1.7					4	1.7				
[a]			12	5.1					4	1.7		
[e]			20	8.5								
[u]			4	1.7								
[m]			20	8.5								
[t]					52	22.1					4	1.7
[d]			4	1.7	8	3.4						
[s]					24	10.1			4	1.7		
[l]			12	5.1	4	1.7						
[r̃]			4	1.7								
[č]			4	1.7								
[y(t)]					8	3.4						
[k]			24	10.1								
[g]			4	1.7								
Totals	4	1.7	108	45.8	96	40.7	4	1.7	8	3.4	4	1.7

TABLE X

SEGMENTS FOLLOWING /en/ WHEN

IT APPEARS AS [ẽ] OR [ẽʔ]

Table XI, although dealing with only four occurrences, shows that the process /in/ $\Longrightarrow$ [ĩ(ʔ)] occurs most frequently in syllable-final environments within a word, 75.0%, and that all four occurrences of this process take place before systematic [f].

(TABLE XI)

Following Segment	[ɪ̃] /__## No.	%	[ɪ̃] /__# No.	%	[ɪ] /__$ No.	%	[ɪ̃ʔ] /__## No.	%	[ɪ̃ʔ] /__# No.	%	[ɪʔ] /__$ No.	%
[f]			1	25.0	3	75.0						
Total	0	0	1	25.0	3	75.0	0	0	0	0	0	0

TABLE XI

SEGMENTS FOLLOWING /in/ WHEN

IT APPEARS AS [ɪ̃] OR [ɪ̃ʔ]

Table XII shows that the process /un/ $\Longrightarrow$ [ũ(ʔ)] occurs: (1) most frequently in word-final position within a breath-group, 81.5% (62.6% and 18.9%); (2) before vowels at a rate of 12.6% versus 87.4% before a following consonant.

(TABLE XII)

Following Segment	[ũ] /__## No.	%	[ũ] /__# No.	%	[ũ] /__$ No.	%	[ũʔ] /__## No.	%	[ũʔ] /__# No.	%	[ũʔ] /__$ No.	%
[e]			4	6.3					4	6.3		
[p]			8	12.4					4	6.3		
[b]			4	6.3								
[t]					4	6.3			4	6.3		
[d]			12	18.7								
[l]			4	6.3								
[r]			4	6.3								
[n]			4	6.3								
[k]					8	12.4						
Totals	0	0	40	62.6	12	18.7	0	0	12	18.9	0	0

TABLE XII

SEGMENTS FOLLOWING /un/ WHEN

IT APPEARS AS [ũ] OR [ũʔ]

Table XIII shows that the process /on/ $\Longrightarrow$ [õ(ʔ)] occurs: (1) most frequently in word-final environments within a breath-group, 52.0% (40.0% and 12.0%), although this same process occurs almost as frequently, 46.0%, in syllable-final environments within a word; (2) before vowels at a rate of 28.0%, versus 72.0% before a following consonant.

(TABLE XIII)

Following	[õ] /__##		[õ] /__#		[õ] /__$		[õʔ] /__##		[õʔ] /__#		[õʔ] /__$	
Segment	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
[a]			8	4.0					4	2.0		
[e]			20	10.0								
[i]												
[o]			8	4.0								
[u]			12	6.0					4	2.0		
[p]									4	2.0		
[b]									4	2.0		
[m]			4	2.0								
[f]			4	2.0								
[t]					4	2.0						
[d]			4	2.0	20	10.0						
[s]			8	4.0	60	30.0			4	2.0		
[l]			12	6.0					4	2.0		
[c]					4	2.0						
[k]					4	2.0						
Totals	0	0	80	40.0	92	46.0	0	0	24	12.0	0	0

TABLE XIII

SEGMENTS FOLLOWING /on/ WHEN

IT APPEARS AS [õ] OR [õʔ]

Table XIV compares the rates of occurrence of the process /VN/ $\Longrightarrow$ [$\tilde{V}$] before the different vowels of Spanish.

(TABLE XIV)

Following Vowel	Number of Occurrences	Percentage of Occurrences
[a]	32	21.1
[e]	52	34.2
[i]	0	0
[o]	60	39.5
[u]	8	5.2
Totals	152	100.0

TABLE XIV

VOWEL NASALIZATION AND NASAL

DELETION BEFORE VOWELS

There appear to be no substantive conclusions which can be drawn from the data in Table XIV relative to which vowels or class of vowels act in any significant way toward effecting the process /VN/ $\Longrightarrow$ [$\tilde{V}$] . This process occurs most frequently before [-high] vowels, 94.8% of the total occurrences, but it is suggested that this percentage is merely indicative of the phonotactics of Spanish which do not favor [+high] vowels plus nasals in word-final environments.

Table XV compares the rates of occurrence of the process /VN/ $\Longrightarrow$ [$\tilde{V}$], relative to the type of consonant which follows.

(TABLE XV)

Following Consonant	Number of Occurrences	Percentage of Occurrences
[p]	16	3.3
[b]	8	1.7
[m]	24	5.1
[f]	8	1.7
[t]	88	18.5
[d]	108	22.7
[s]	104	21.8
[n]	4	0.8
[l]	48	10.1
[r]	8	1.7
[č]	8	1.7
[y]	8	1.7
[k]	40	8.4
[g]	4	0.8
Totals	476	100.0

TABLE XV

VOWEL NASALIZATION AND NASAL

DELETION BEFORE CONSONANTS

From the data presented in Table XIV, the following observations are noted, relative to the process /VN/ $\Longrightarrow$ [$\tilde{V}$]: (1) This process takes place before [+anterior] segments at a rate of 87.4%; (2) The process occurs before [+coronal] segments at a rate of 77.3%; (3) Before [+anterior; +coronal] segments at a rate of 75.6%; (4) Before [-sonorant] segments 80.6% of the time; (5) Before [+continuant] segments 37.0% of the time, or conversely, before [-continuant] segments at a rate of 63.0%. The natural class before which the process /VN/ $\Longrightarrow$ [$\tilde{V}$] occurs would seem to be [+anterior; +coronal; -sonorant; -continuant], before which the above process occurs at a rate of 41.2%. Since, however, the significance of the above natural class, particularly in light of the less than significant percentage of occurrence (41.2%) is somewhat questionable, a more meaningful statement relative to the data given in Table XIV would be: [+anterior; +coronal] segments appear to be a conditioning factor before which the processes of vowel nasalization followed by deletion of the nasal consonant occurs, across both syllable-boundaries within a word, and across word-boundaries, before which the above mentioned processes occur at a rate of 75.6%. It seems

that the blade of the tongue and the region of the oral cavity between the lips and the alveolar ridge are a rather strong conditioning factor on the process of /VN/ $\Longrightarrow$ [$\tilde{V}$].

The presence of the velar nasal in environments other than before a following velar segment is a well-known and well-documented phenomenon in Cuban Spanish, as well as in other Spanish dialects. The processes of vowel nasalization followed by deletion of the nasal consonant, though less well-documented, have previously appeared in the literature concerning Cuban Spanish, e.g. Isbaşescu (1968). The presence of the velar nasal, which is highly-marked and rather less common in languages of the world, in contexts other than before velar consonants, has always been rather unexplainable. With the available evidence now showing the process /VN/ $\Longrightarrow$ [$\tilde{V}$] to be rather common in Cuban Spanish dialects, the question arises as to the relatedness of these two phenomena, i.e. /VN/ $\Longrightarrow$ [$\tilde{V}$], and the appearance of [ŋ] in contexts other than before velar consonants. The precise question that arises is whether a significant percentage of what has heretofore been reported as a velar nasal was, in reality, the velar nasal, or was in actuality, a nasalized vowel.

For some reason, it seems that nasalized vowels are often perceived as being followed by velar nasals.[9] It seems logical, or at least explainable, that nasalized vowels should be perceived as velar nasals, since during the production of nasal vowels, when the velum is lowered, the velum provides the most prominent obstruction in the oral cavity. In the production of non-velar nasal consonants, however, the velum provides only a secondary obstruction, the main obstruction being complete closure somewhere anterior to the velum. These facts would perhaps help to explain why nasal vowels are perceived as being followed by velar nasals, but that non-velar nasal consonants are not perceived as such.

If it is the case that we do perceive nasalized vowels as [$\tilde{V}\eta$], then it is also possible that what has been frequently reported in Cuban Spanish as [η] may have been, in reality, a nasalized vowel. If this suggestion were empirically testable, then many of the theoretical problems concerned with the presence of the velar nasal would be somewhat diminished, since, particularly in rapid speech, nasalized vowels are less-marked, less complex, and more frequent among the world's languages than is the velar nasal. Systematic

/n/ nasalizing a preceding vowel and then being deleted, especially in rapid speech, certainly seems more natural than replacing systematic /n/ with the more complex, more highly-marked velar nasal [ŋ].

Another plausible explanation for what has been reported as a velar nasal is that after the nasal consonant has been deleted, a glottal stop is inserted, resulting in the surface string [Ṽʔ] ; this string, since it is quite possible that the glottal stop is perceived as being velar, could easily be perceived as [Ṽŋ]. Recall that the presence of the glottal stop [ʔ] was reported in Tables I, IV, and VIII of this study.

NOTES

[1][ẽʔ] represents a nasalized mid-front vowel, followed by a glottal stop.

[2]There were 92 occurrences of /n/ followed by a word whose initial segment was velar, in which the velar nasal and standard nasal assimilation are the same phonetic manifestation. Therefore, these 92 occurrences are not included in the data in Table II.

[3]It should be mentioned here that the expression ven acá, in which the velar nasal almost always occurs, and which is extremely frequent in informal Cuban Spanish spoken in the Miami, Florida area, will be effecting, perhaps adversely, these data, causing the percentage of occurrence of the velar nasal before a following [+syllabic] segment to be higher than what might be considered "normal" for Cuban Spanish.

[4]The rule of nasal assimilation shown here in (5) is a revised version of Harris' (1969) rule of nasal assimilation, because Harris (1969), as stated, will not account for this nasal assimilation process in Cuban Spanish, because in Cuban Spanish, nasal assimilation also takes place before [+nasal] segments, like in many other dialects of Spanish. Harris' (1969) rule of nasal assimilation is:

$$[+\text{nasal}] \longrightarrow \begin{bmatrix} \alpha\,\text{cor} \\ \beta\,\text{ant} \\ \gamma\,\text{back} \\ \delta\,\text{distr} \end{bmatrix} \; / \; \underline{\quad\quad}(\#) \begin{bmatrix} +\text{obs} \\ \alpha\,\text{cor} \\ \beta\,\text{ant} \\ \gamma\,\text{back} \\ \delta\,\text{distr} \end{bmatrix}$$

The change from [+obs] in the environment of Harris' version of this rule to [-syl] as shown in (5) will account for assimilation to a following nasal, and will vacuously account for assimilation to a following liquid. Note also that Harris (1969) must extrinsically order a rule converting the glides [y] and [w] to the consonantal segments [$\hat{y}$] and [$\overset{w}{g}$] before the application of the rule of nasal assimilation. The revision proposed in (5) avoids this extrinsic ordering, because [-syl] will also account for glides.

The feature [high] must also be added, using the alpha convention, to both the environment and the structural change in the proposed revision to account for systematic /n/ assimilating to a following palatal nasal, e.g. un ñame 'a yam', [uñ ñáme].

[5]There were 168 occurrences of systematic /n/ followed by a velar segment. As was the case in Table II, these 168 occurrences are not included in the data in Table V.

[6]It should be mentioned here that the frequently occurring lexical item entonces, in which the underlying nasal segments usually are deleted on the surface level, with prior nasalization of the preceding vowel, will possibly cause percentages that do not reflect the true actual rates of occurrence of [ŋ], [n], and [Ṽ].

[7]In his study of the phonology of Miami-Cuban Spanish, Bohdan Saciuk, who was the first to observe this, reports the same phenomenon (personal communication), where, when the velar nasal occurs in syllable-final position within a word, it occurs almost exclusively before voiceless [t], and almost never before voiced [d].

[8]The use of /VN/ $\Longrightarrow$ [Ṽ(ʔ)] is only a shorthand device used in this study to represent the rule of vowel nasalization followed by deletion of the nasal consonant, merely as a means of avoiding needless repitition. Nothing theoretical is implied by this rule formalism.

[9]Bohdan Saciuk (personal communication) reports that frequently in Brazilian Portuguese the velar nasal is perceived following a nasalized vowel.

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